REMARKS

Claims 27-77 are pending in this application. Claims 27-66 have been withdrawn as being directed to nonelected subject matter.

Section 102 and 103 Rejections

The Office Action rejects claims 67 and 69 under 35 U.S.C. 102(e) as being anticipated by Kobayashi et al. (U.S. Patent No. 5,997,598). The Office Action also rejects claim 68 under 35 U.S.C. 103(a) as being obvious over Kobayashi et al. in view of Johnson (U.S. Patent No. 6,102,977). The Office Action also rejects claim 70 under 35 U.S.C. 103(a) as being obvious over Kobayashi et al. in view of "Applicant Admitted Prior Art" (referred to hereinafter "AAPA"). Claims 71-77 are rejected under 35 U.S.C. 103(a) as being obvious over Kobayashi et al. in view of Mitani et al. (U.S. Patent No. 5,804,494) in view of AAPA. These rejections are traversed.

The present claims require, inter alia, "[c]lean room air conditioning facilities comprising an air conditioner having a boron-less filter and a boron adsorbing filter; and one or more wafer treatment apparatuses **each having a boron-less filter**" (see claim 1). The atmosphere gas is recycled between the air conditioner, the clean room and the wafer treatment apparatuses.

Kobayashi et al. describe an air filter for a clean room. In their Example 3, Kobayashi et al. disclose that "the wall material, the filter material for the air filter (ULPA filter) and the sealing material for securing the filter medium and the frame of the air filter were used in the combination shown in Table 6 to fabricate each of local facilities for use in semiconductor production apparatus" (column 14, lines 55-60).

The Office Action asserts that Kobayashi et al. teaches "...one or more of wafer treatment apparatuses (local facilities) each having a boron-less filter (ULPA filter)..."

However, Table 6 on columns 23 and 24 of the Kobayashi et al. patent makes clear that the boron content of the ULPA filter ("U.F.") material ranges from 15 to 52 μg/g.

As the Office Action notes, the present specification refers to a boron-less filter as being "an air filter from which no boron is released" (see page 8, line 25 to page 9, line 1 of the present specification. The Office Action then asserts that Kobayashi et al. teaches a boron-less filter since there is no measurable boron in the local facilities described in Kobayashi et al.

However, the boron-containing filters of Kobayashi et al. are not air filters from which no boron is released. Kobayashi et al. disclose that "[a]s can be seen from the results, in the local facilities of Nos. 31 and 33 corresponding to the embodiments of the [Kobayashi et al.] invention, analysis values for the organic phosphorus compounds and the boron compounds in the air at the inside of the local facilities are below the detection limit values, and since the organic phosphorus compounds and the boron compounds are not present in the local facilities, such local facilities are particularly suitable as the local facility for use in semiconductor production. On the contrary, the local facilities of Nos. 32 and 34 corresponding to the comparative examples of the [Kobayashi et al.] invention are not desired, since either the organic phosphorus compounds or the boron compounds are present in the air at the inside of the local facilities and there [is] a worry of causing unnecessary doping for the local facility used in the semiconductor production" (see column 15, line 10 to column 16, line 10).

In fact, the components of the boron-containing filters used in Kobayashi et al. Examples No. 31 and No. 33 appear to be the same as the components used in the boron-containing filters of Kobayashi comparative Examples No. 32 and 34, respectively. As the filters appear to be the same, and as Kobayashi et al. explain that the filters of Examples No. 32 and/or 34 release boron since boron is in the air at the inside of the local facilities, the filters of Examples No. 31 and No. 33, being the same as filters 32 and 34, respectively, would also be expected to release boron.

The present specification characterizes one property of a "boron-less" filter as not releasing boron. The Office Action takes the position that since the filter of Kobayashi does not release boron, the limitation of claim 67 is met. Applicants respectfully disagree that Kobayashi does not release boron.

Applicants wish to explain about a boron-less filter used in the present application (e.g., a boron free ULPA filter (Nippon Muki Co., Ltd. ATMMF-31-P-B); see page 25, the last paragraph of the present specification). As a filter medium, A PTFE (Poly Tetra Fluoro Ethylene) complex material is used for "a boron-less filter" of the present patent application. According to the test result by the manufacturer, boron is not detected from this filter medium. On the other hand, as the comparative example thereof, boron is detected from a filter medium made of glass fibers. Further, at the ultrapure water elution test of the filter medium, boron is not detected from the PTFE complex filter medium while it is detected from the glass filter medium (see the attached English translation of the pamphlet of the manufacturer).

Thus, it is clear that the filter used in Kobayashi contains boron and releases a small amount of boron because in Kobayashi, the amount of boron content in the PTFE

complex filter medium is below detection limit value (see the Examples 24 and 28 of Kobayashi) while boron is detected from the glass filter medium (see the other Examples). Therefore, the filter used in Kobayashi is clearly different from that of the present claims. "The boron-less filter" used in the present application does not contain boron indeed, but the filter used in Kobayashi is not a boron-less filter. Furthermore, in the present application, the boron concentration in the clean room is 15 ng/m^3 or less (e.g., see page 26 of the present specification). On the other hand, in Kobayashi, the boron concentration in the clean room is about 100 ng/m^3, and therefore, the boron concentration in the clean room of Kobayashi is much higher than achieved with the present invention. Accordingly, performance of the filter used in the present application is very different from that of the filter used in Kobayashi.

Accordingly, the present invention as claimed was not anticipated and would not have been obvious to a person of ordinary skill in the art at the time the invention was made in view of Kobayashi.

The asserted AAPA is applied to show that boron can attach on a surface of a silicon wafer. However, as the AAPA does not teach or suggest "one or more wafer treatment apparatuses each having a boron-less filter" as required by the present claims, the AAPA fails to make up for the deficiencies in Kobayashi et al.

Mitani et al. is applied only to show the boron concentration in a silicon wafer. As is the case for Kobayashi et al. and the AAPA, Mitani et al. does not teach or suggest "one or more wafer treatment apparatuses each having a boron-less filter" as required by the present claims. Mitani et al. thus fails to make up for the deficiencies in Kobayashi et al. and in the AAPA.

Johnson is applied only to show an outside air handler. As is the case for Kobayashi et al., AAPA, and Mitani et al., Johnson does not teach or suggest "one or more wafer treatment apparatuses each having a boron-less filter" as required by the present claims. Johnson thus fails to make up for the deficiencies in Kobayashi et al., the AAPA, and Mitani et al.

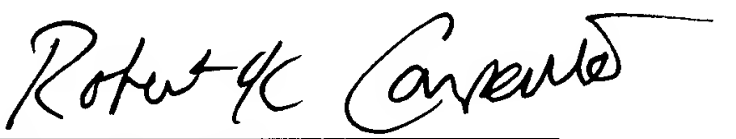
For at least the above reasons, claims 67-77, all of which require "one or more wafer treatment apparatuses each having a boron-less filter," are patentable over Kobayashi et al. alone, or in any combination with the AAPA and/or Mitani et al. and/or Johnson.

Conclusion

In view of the above remarks, Applicants respectfully submit that this application is in condition for allowance. Favorable consideration and prompt allowance of the claims are earnestly solicited. Should the Examiner believe anything further is desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact Applicants' undersigned attorney at the telephone number listed below.

In the event this paper is not considered to be timely filed, Applicants respectfully petition for an appropriate extension of time. The Commissioner is authorized to charge payment for any additional fees which may be required with respect to this paper or credit any overpayment to Counsel's Deposit Account 01-2300, making reference to Attorney Docket No. 107242-00017.

Respectfully submitted,



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Analysis of the metallic ingredient of filter medium

I. Purpose

(1) Checking types and amounts of the metallic elements contained in filter medium.

(2) Checking the metallic elements that become a subject of discussion in the process of manufacturing a semiconductor, such as Boron, Phosphorus, do not generate.

(3) Checking the possible elements that may be generated, by means of the qualitative analysis and the quantitative analysis of the small amount of elements that cannot be detected by GC-MS (Gas Chromatography Mass Spectrometer).

II. Testing method

After crushing a test sample into the fragments and resolving the fragments by sulfuric acid and nitric acid, the qualitative analysis and the quantitative analysis of elute was carried out by means of ICP-OES (Inductively Coupled Plasma Optical Emission Spectroscopy). A PTFE (Poly Tetra Fluoro Ethylene) complex film filter medium was fully resolved, but numerical values of a glass filter medium were only for elution because the glass filter medium was not fully resolved.

III. Result

Elements detected by the qualitative analysis and the quantitative analysis were shown in Table 1.

Table 1: The metallic elements contained in the filter medium (an example of measurement)

Unit: μg/g

No.	Name of detected element	Detection limit	PTFE complex film filter medium	Glass filter medium
1	B (boron)	20	ND	1-10 %
2	P (phosphorus)	200	ND	ND
3	Si (silicon)	100	ND	the main

				component
4	Na (sodium)	10	ND	1-10 %
5	K (kalium)	20	ND	1,000-10,000
6	Al (aluminium)	20	ND	1,000-10,000
7	Ba (barium)	10	ND	ND
8	Ca (calcium)	2	ND	1,000-10,000
9	Fe (iron)	10	ND	10-100
10	Mg (magnesium)	10	ND	10-100
11	Sb (antimon)	100	100-1,000	ND
12	Sr (strontium)	2	ND	10-100
13	Ti (titanium)	10	1,000-10,000	10-100
14	Zn (zinc)	10	ND	100-1,000

* ND (Not Detected) : below detection limit value

VI. Observations

(1) The metallic elements that become a subject of discussion in the process of manufacturing a semiconductor, such as Boron, Phosphorus, did not generate from the PTFE complex film filter medium. Thus, the PTFE complex film filter medium does not contain the above elements.

(2) The metallic elements contained in the PTFE complex film filter medium is much less than that contained in the glass filter medium.

Ultrapure water elution test of filter medium

I. Purpose

(1) In a clean room used in the technical field of semiconductor or liquid crystal, contamination from each of the members provided in the clean room by the small amount of gas is a problem. Specifically, boron, which is generated from a filter medium of glass fiber, or volatile organic material, which is generated from a variety of resins, is the problem.

Accordingly, I checked the amount of metallic content eluted into ultrapure water by carrying out an elution test into ultrapure water of a filter medium used in the boron-free filter.

II. Testing method

After immersing a PTFE complex film filter medium (200 x 200 mm) and a glass filter medium (200 x 200 mm) into ultrapure water (80 ml) for three days, eluted metallic content was measured by ICP-MS (Inductively Coupled Plasma Mass Spectrometry).

III. Result

Elements detected by the measurement were shown in Table 1.

Table 1: The amount of eluted metallic content from the filter medium

Unit: ng/ml (ppb)

No.	Name of detected element	PTFE complex film filter medium	Glass filter medium
		Measured value	Measured value
1	Na (sodium)	20	6000
2	K (kalium)	13	1000
3	Mg (magnesium)	1	70
4	Ca (calcium)	20	500
5	Sr (strontium)	ND	7
6	Ba (barium)	ND	80
7	Ti (titanium)	ND	0.3
8	Fe (iron)	3	8
9	Zn (zinc)	2	80
10	B (boron)	ND	2000
11	Al (aluminium)	ND	20
12	Sb (antimon)	ND	0.3

* ND (Not Detected) : below detection limit value

VI. Observations

(1) The metallic elements that become a subject of discussion in the process of manufacturing a semiconductor, such as Boron, Phosphorus, silicon did not generate from the elute.

ろ材の金属成分分析

1．目的

(1)ろ材に含まれる金属元素の種類と量を確認しました。

(2)半導体製造工程で問題となっているB、Pといった金属元素が発生していないことを確認しました。

(3)GC−MSでは、検出しない微量金属の定性・定量を行い発生する可能性のある元素を確認しました。

2．試験方法

試験体を細かく粉砕した後、硫酸及び硝酸により分解した液をＩＣＰ発光分光法により定性分析(Ｌｉ～Ｂｉ)及び半定量分析をしました。ＰＴＦＥ複合膜ろ材は全分解しましたが、ガラスろ材は、全分解していないため溶出分のみの値となっています。

3．結果

定性・半定量分析により検出された元素について表１にまとめました。

表１　ろ材に含まれる金属元素（測定の一例）

単位：μｇ／ｇ

No.	検出元素名	検出限界	ＰＴＦＥ複合膜ろ材	ガラスろ材
1	Ｂ　(ホウ素)	20	ＮＤ	1～10%
2	Ｐ　(リン)	200	ＮＤ	ＮＤ
3	Ｓｉ(ケイ素)	100	ＮＤ	主成分
4	Ｎａ(ナトリウム)	10	ＮＤ	1～10%
5	Ｋ　(カリウム)	20	ＮＤ	1,000～10,000
6	Ａℓ (アルミニウム)	20	ＮＤ	1,000～10,000
7	Ｂａ(バリウム)	10	ＮＤ	ＮＤ
8	Ｃａ(カルシウム)	2	ＮＤ	1,000～10,000
9	Ｆｅ(鉄)	10	ＮＤ	10～100
10	Ｍｇ(マグネシウム)	10	ＮＤ	10～100
11	Ｓｂ(アンチモン)	100	100～1,000	ＮＤ
12	Ｓｒ(ストロンチウム)	2	ＮＤ	10～100
13	Ｔｉ(チタン)	10	1,000～10,000	10～100
14	Ｚｎ(亜鉛)	10	ＮＤ	100～1,000

注）ＮＤ：検出限界以下

4．考察

(1)ＰＴＦＥ複合膜ろ材からは半導体製造工程で問題となるＢ、Ｐ、Ｓｉと云った無機系の元素は、検出されませんでした。よって、ＰＴＦＥ複合膜ろ材は、これらの元素を含有していません。

(2)ＰＴＦＥ複合膜ろ材の含有金属元素量は、ガラスに比べ非常に少なくなっています。

以上

ろ材の超純水溶出試験

1．目的

半導体・液晶等の分野のクリーンルームにおいて、各種部材から発生する微量ガスによる汚染が問題となっています。特にガラス繊維ろ材を用いたフィルタからの発生するボロンや、各種樹脂から発生する揮発性有機物質は問題となっています。

そこで、ボロンフリーフィルタのろ材の超純水中への溶出試験を行い、溶出金属成分量を確認しました。

2．試験方法

200×200mm のＰＴＦＥ複合膜とガラスろ材を 80mℓ の超純水中に３日間浸漬し、溶出した金属成分をＩＣＰ－ＭＳで測定しました。

3．結果

測定により検出された元素について表１にまとめました。

表１　ろ材からの溶出金属量

単位：ｎｇ／mℓ (ppb)

No.	検出元素名	ＰＴＦＥ複合膜	ガラスろ材
		測定値	測定値
1	Ｎａ(ナトリウム)	20	6000
2	Ｋ　(カリウム)	13	1000
3	Ｍｇ(マグネシウム)	1	70
4	Ｃａ(カルシウム)	20	500
5	Ｓｒ(ストロンチウム)	ＮＤ	7
6	Ｂａ(バリウム)	ＮＤ	80
7	Ｔｉ(チタン)	ＮＤ	0.3
8	Ｆｅ(鉄)	3	8
9	Ｚｎ(亜鉛)	2	30
10	Ｂ　(ホウ素)	ＮＤ	2000
11	Ａℓ (アルミニウム)	ＮＤ	20
12	Ｓｂ(アンチモン)	ＮＤ	0.3

注：ＮＤ：検出限界以下

4．考察

(1)ＰＴＦＥ複合膜ろ材の溶出液からは、半導体・液晶等製造工程で問題となるＢ、Ｐ、Ｓｉと云った金属元素は、検出されませんでした。

以上